MODIFIED ELECTRODES BASED ON FERROCENE ATTACHED TO MULTI-WALLED CARBON NANOTUBES: APPLICATION TO GLUCOSE BIOSENSING

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Since their characterization in 1991[1], carbon nanotubes (CNT) have revealed fascinating properties. Their great conductivity, wide surface area and ease of modification make them great candidates for building nanostructured electrodes in a wide variety of applications. In particular, immobilizing organometallic molecules on CNT gives access to modified electrodes for sensing and electrocatalysis applications.

Immobilizing a redox probe like ferrocene is extensively studied to build up new glucose sensors; indeed ferrocene plays the role of an electron mediator in the biocatalytic oxidation of glucose to gluconolactone by glucose oxidase[2]. Hence, functionalizing CNT with ferrocene derivatives can lead to very sensitive nanoelectrodes for glucose sensing[3].
In this way, we compared two original methods for immobilizing ferrocene groups on a Multi-Wall CNT electrode. The first one is based on the π-stacking properties of pyrene towards CNT. Electrochemical studies indicate the robust immobilization of 2-pyrenylethyl 2-ferrocenylethanoate on a CNT electrode (figure **A**). The second method is based on the modification of CNT by the electrogeneration of aryl radicals from the reduction of diazonium salts[4]. The electroreduction of amine-functionalized aryldiazonium salts was performed at an ITO/MWCNT electrode. A post-fonctionalization step reaction achieved the immobilization of the ferrocene moiety (figure **B**). Both modified CNT-based materials were characterized by electrochemistry and XPS measurements. The efficiency of the two synthetic methods and the activity of the resulting modified electrodes towards glucose biosensing were compared.

References:

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Figures: